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**Soil
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Huron,
South Dakota

TECHNICAL NOTE

AGRONOMY NO. 10

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and
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October 6, 1993

CASE STUDIES OF FARMING SYSTEMS

This Technical Note transmits the results of case studies of farming systems in the Lower James River area of South Dakota. These studies were completed by the Lower James Alliance for Crop Residue Management in 1993. They compared the economic strengths and weaknesses of no-till, reduced till, and conventional tillage for corn and soybeans. This comparison of 12 farms and 27 fields provides a snapshot of Eastern South Dakota farming.

Several generalizations were found in this study. No-till farming has the lowest machinery costs and has lower total costs than conventional tillage. Various reduced till budgets, including ridge-till, may have the lowest costs. These generalizations were also visible in corn/soybean budgets from Moody and Brookings Counties, and in corn/soybean/spring Wheat budgets from both Brown and Roberts Counties. The 1991 and 1992 corn-belt-wide MAX study with thousands of participating farms showed the same trends.

This publication also shows how the CARE program can be used locally for cost comparisons. The CARE program is available in CAMPS on each field office computer. Completed interview forms can also be sent to David Buland for input into the program. Additional details on the Lower James RC&D study can be obtained from the Lower James RC&D or from David Buland at the Soil Conservation Service State Office.

SHERIDAN I. DRONEN
State Resource Conservationist

Attachments

File under: Agronomy

PILOT PROJECT

CASE STUDIES OF FARMING SYSTEMS

CONVENTIONAL, NO-TILL, RIDGE-TILL, AND REDUCED-TILL SYSTEMS

1992 CROP YEAR

LOWER JAMES RIVER AREA OF SOUTH DAKOTA

CASE STUDY DATA FROM 12 FARMS ON 27 FIELDS

PREPARED BY:

LOWER JAMES ALLIANCE FOR CROP RESIDUE MANAGEMENT

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OVERVIEW:

The Lower James Alliance for Crop Residue Management is a cooperative effort by agbusiness, farmers, and agencies to provide information/education and technical assistance to on-farm users of ridge-till, no-till, & reduced-till.

Economic data on crop residue management was one of the top needs identified by the Alliance in November of 1992. Specifically, data was needed from farmers, in the immediate area, who currently use no-till, ridge-till, or reduced-till farming systems.

The Alliance began working with farmers in December of 1992, collecting data on the farming systems they used during the 1992 season. Selected for the development of crop budgets was the "CARE" computer program, due to minimum input needs and tested reliability to actual on-farm costs.

Twelve farmers participated in the case studies involving 27 fields, in the four counties of Hanson, Hutchinson, Jerauld, & Sanborn.

The averaging of the case study data, by crop planted and type of tillage system, provides on-farm data for discussion. It also indicates some potential important economic trends for additional analysis.

The amount of data collected IS NOT A SUFFICIENT BASE ON WHICH TO DRAW RELIABLE CONCLUSIONS. It is an accurate accounting of these 27 local fields.

This pilot effort does show the value of case studies to show the on-farm methods farmers are using to apply these new farming system technologies. Currently proposed is the expansion of this effort in 1993 to include at least 25 farms and approximately 100 fields in 1993.

Assistance in this effort, (making the use of the CARE program possible), was provided by Dave Buland, Ag Economist, Soil Conservation Service, Huron.

DISCUSSION OF DATA COLLECTED:

The case study data was collected on-farm by staff of the Lower James RC&D, Mitchell, employed to assist the Lower James Alliance for Crop Residue Management.

The data after entrance into the "CARE" crop budget program is outputted as either a summary crop budget or a detailed crop budget, (See appendix A,B,& C, for example data collection sheet, summary budget, and first page of the detailed budget).

From the case study data, a table of budget item costs was developed, (see page 5), excluding many costs that are only slightly dependent on

the type of farming system, (ie. harvest, trucking, etc.). The selected parameters for analysis were:

a. Tillage costs, (machinery, power unit, labor, fuel repair, maintenance, etc., to include the cost of the spraying operations).
b. Chemical costs, (herbicide costs, not to include cost of application).
c. Tillage + Chemical (a + b)
d. Fuel, (total cost for all operations to include harvest @ $.809/gal. for diesel and gasoline)
e. Labor, (cost based on hours needed X a wage range of $5 - $6.50/hour).

Selected for comparison were the farming systems: 1) No-till; 2) Ridge/Reduced-till; 3) Conventional. Conventional farming systems are often very close to reduced systems, as only two conventional fields were plowed. Lacking is case study fields for ridge-till farming, with only 2 available. Ridge-till farming systems are as adapted and as used on-farm as the other systems in the Lower James Area, and are considered by this project to be closest to reduced-till for cost, (not comparable otherwise, ie. soil tilth, equipment, etc.).

The crops selected for comparison were beans, corn, and corn/soybean rotation based on 1992 conditions. In addition to the 27 fields used here, data from two fields of wheat was collected but is not presented here. Also, only one case study was available for Ridge/Reduced till for soybeans, while all other averaged conditions were from 3-8 case study fields.

The comparisons are shown by table 2, (page 6), and by the following graphs:

1. Soybeans, (page 6)
2. Corn, (page 7)
3. Corn/Soybean rotation, (page 8)
4. Corn yields, (page 9)
5. Soybean yields, (page 9)
6. Fuel usage, (page 10)
7. Labor needs, (page 11)

DISCUSSION OF CASE STUDY ECONOMICS:

The data shows the following key considerations for further analysis and on-farm discussion.

1.) <u>TILLAGE:</u> As expected, tillage costs are lowest with no-till farming systems. The lack of sufficient case study fields for reduced/ridge-tilled soybeans may be the cause for high tillage costs above conventional. Corn tillage production costs are lower with reduced/ridge-till than for conventional. This apparent tillage cost economic advantage for high residue systems can be used, dependent on current individual farm equipment types and age.

2.) <u>CHEMICAL:</u> Chemical usage here is based on dollars of cost for herbicides. It does not address quantity used nor environmental risk levels of different chemicals. Generally, the major herbicides used by all systems are the same. Chemical usage for both corn and soybean production was highest with no-till, averaging $3-5/ac. more than with

conventional. Chemical usage by ridge-till or no-till farmers can not be automatically considered greater than herbicide usage under conventional systems. Veteran no-tillers (4+ years) show similar or less herbicide usage than the conventional case studies, implying that initially, chemical use is higher, but long-term use may be lower. As on-farm experience with residue management increases and with price reductions on key burndown chemicals, the cost gap between conventional and no-till will close and may be reversed.

TILLAGE + CHEMICAL/AC. ON COSTS: No-till, ridge-till and reduced-till have lower tillage + chemical/ac. on costs than conventional systems. This results from savings in tillage costs that exceed the additional chemical costs.
Tillage + chemical/ac. on costs savings (no-till vs. conventional) was:

- corn; $5.89
- soybeans; $10.20
- corn/soybeans rotation: $16.11

This economic advantage for residue management is the major factor driving the yearly increase in use of no-till, ridge-till, and reduced-till by area farmers.

3.) Yield comparisons showed no obvious yield advantage to any of the compared systems. Farming profit is an indication of net profit, which determines success versus yield as the dominant farming goal. 1992 was a wetter than average year, and in 1991, a dry year, (2 case study fields) high residue fields generally out yielded conventional fields.

4.) Labor and Fuel savings may be very important benefits of ridge/no-till systems, relative to production costs, energy conservation, and freeing of additional time for farm management, recreation, or other off-farm employment.
For 100 acres, the savings in labor and fuel using no-till versus conventional would be:

Labor:
- corn; 1 hour per acre = $550 per 100 acres @ $5.50/hr.
- soybeans; .3 hour per acre = $165 per 100 acres @ $5.50/hr.

Fuel:
- corn; 3.2gallons/ac. = $260 per 100 acres @ $.81/gallon.
- soybeans: 1.3gallons/ac. = $105 per 100 acres @ $.81/gallon.

Crop Residue Management is being adopted and tried by farmers in this area. The driving factor seems to be an opportunity for economic gain. Success in the short-term and the timing of or system adapted will vary with specific farms.

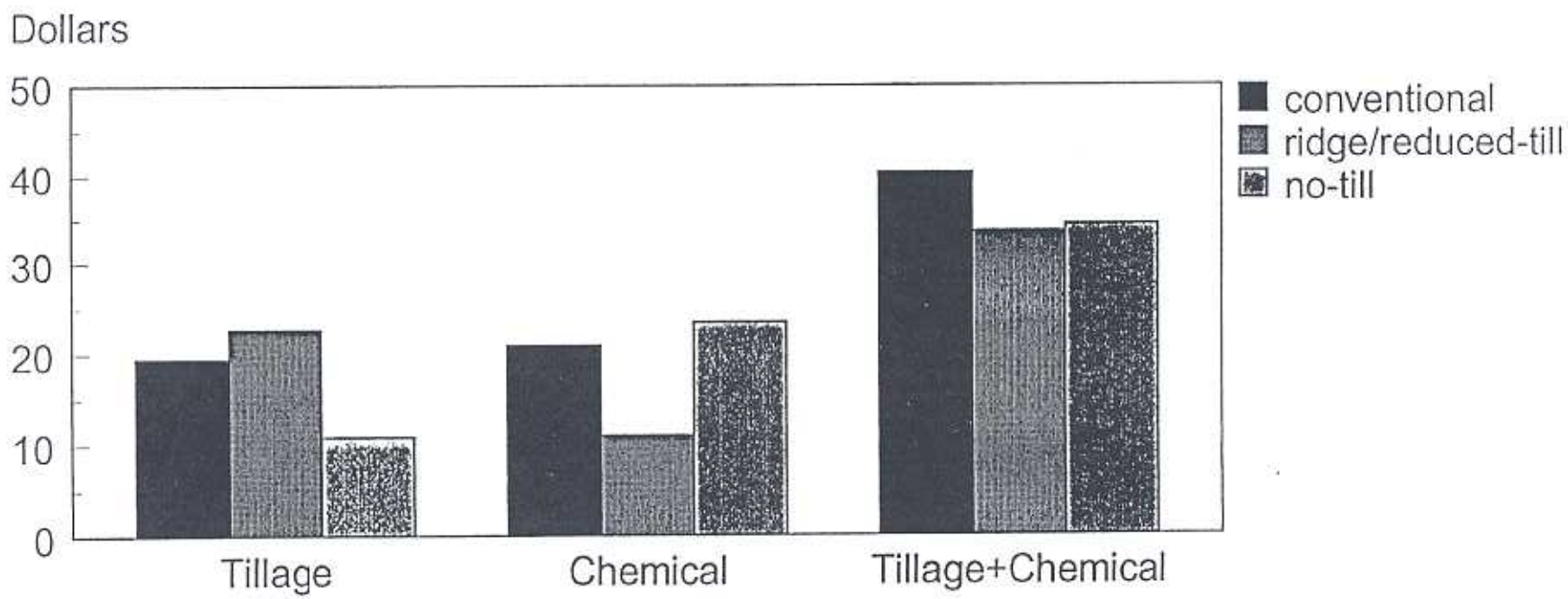
With agriculture as the dominant industry in the Lower James River Area, No-till, Ridge-till, and Reduced-till are new technologies worthy of attention by area farmers and economic development interests in South Dakota.

type	till	chem	tillchem	fuel_gal	labor_hr	yield
conventional beans	19.42	20.96	40.38	3.9	0.96	36.3
ridge/reduced till	22.70	11.02	33.72	3.9	0.77	40.0
no-till beans	10.93	23.56	34.49	2.6	0.69	37.5
conventional corn	26.66	18.07	45.35	5.3	1.50	97.0
ridge/reduced till	17.52	15.55	33.07	2.7	0.73	99.0
no-till corn	11.40	23.73	35.13	2.1	0.56	96.3
conventional c/s	46.08	39.03	85.73	9.2	2.50	36.3/97.0
ridge/reduced c/s	40.22	26.57	66.79	6.7	1.50	40.0/99.0
no-till c/s	22.33	47.29	69.62	4.7	1.30	37.5/96.3

Case Study Farming Systems

Soybean Production Expenses

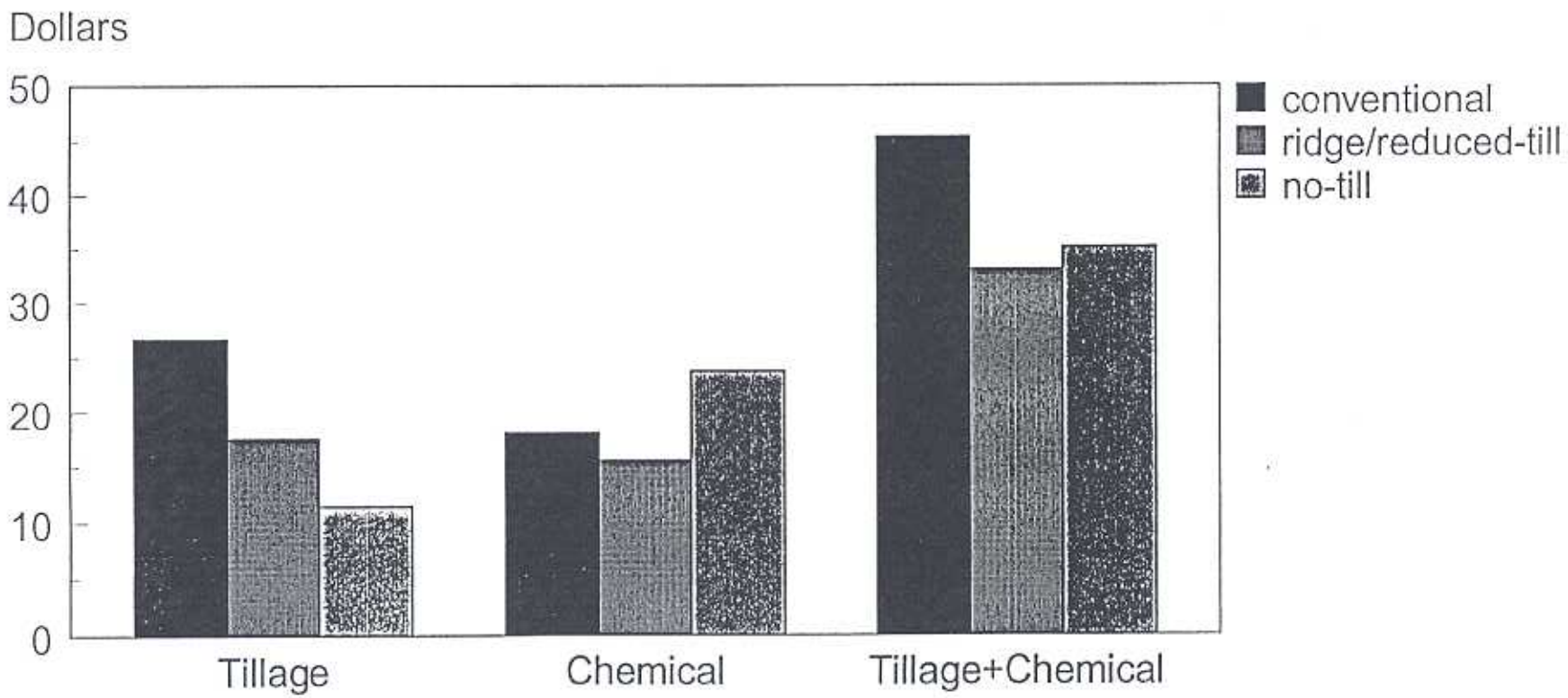
1992



Case Study Farming Systems

Corn Production Expenses

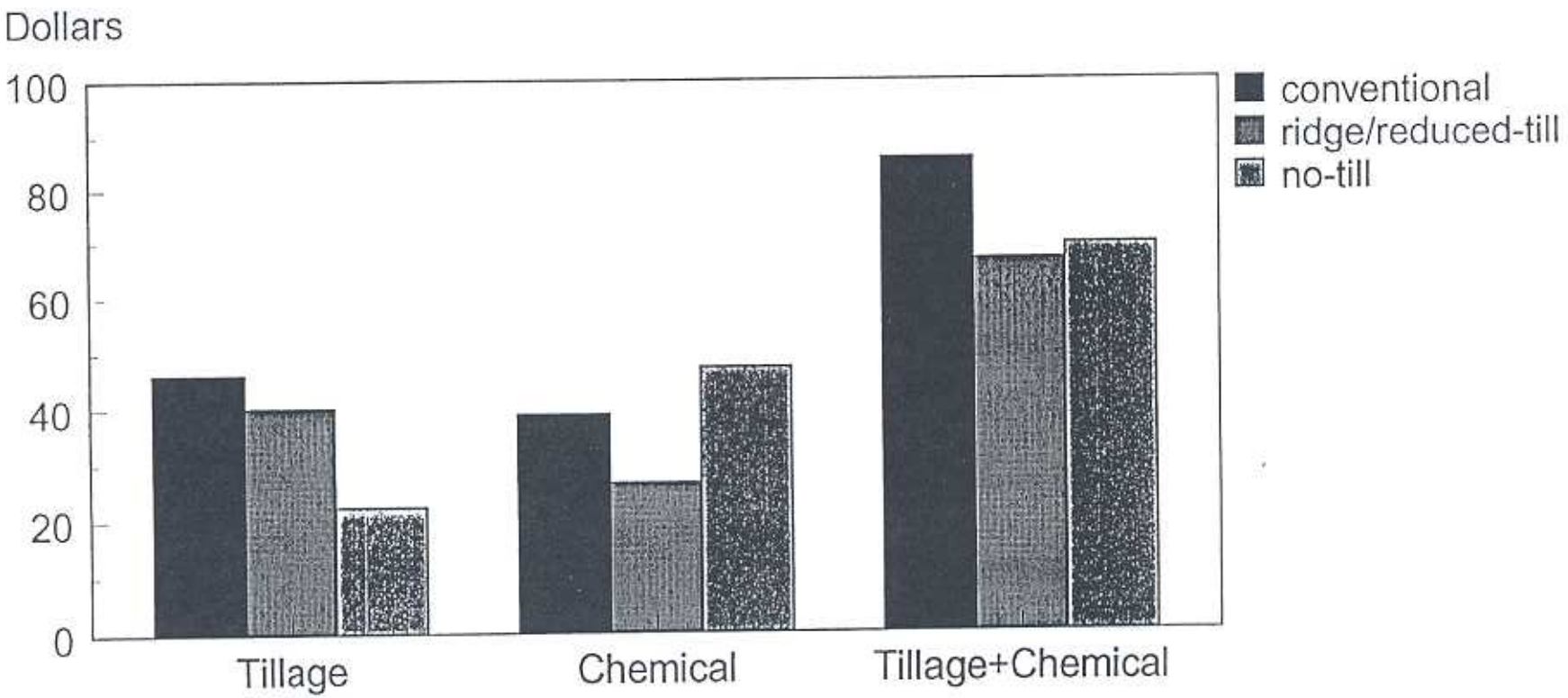
1992



Case Study Farming Systems

Corn/Soybean Rotation Expenses

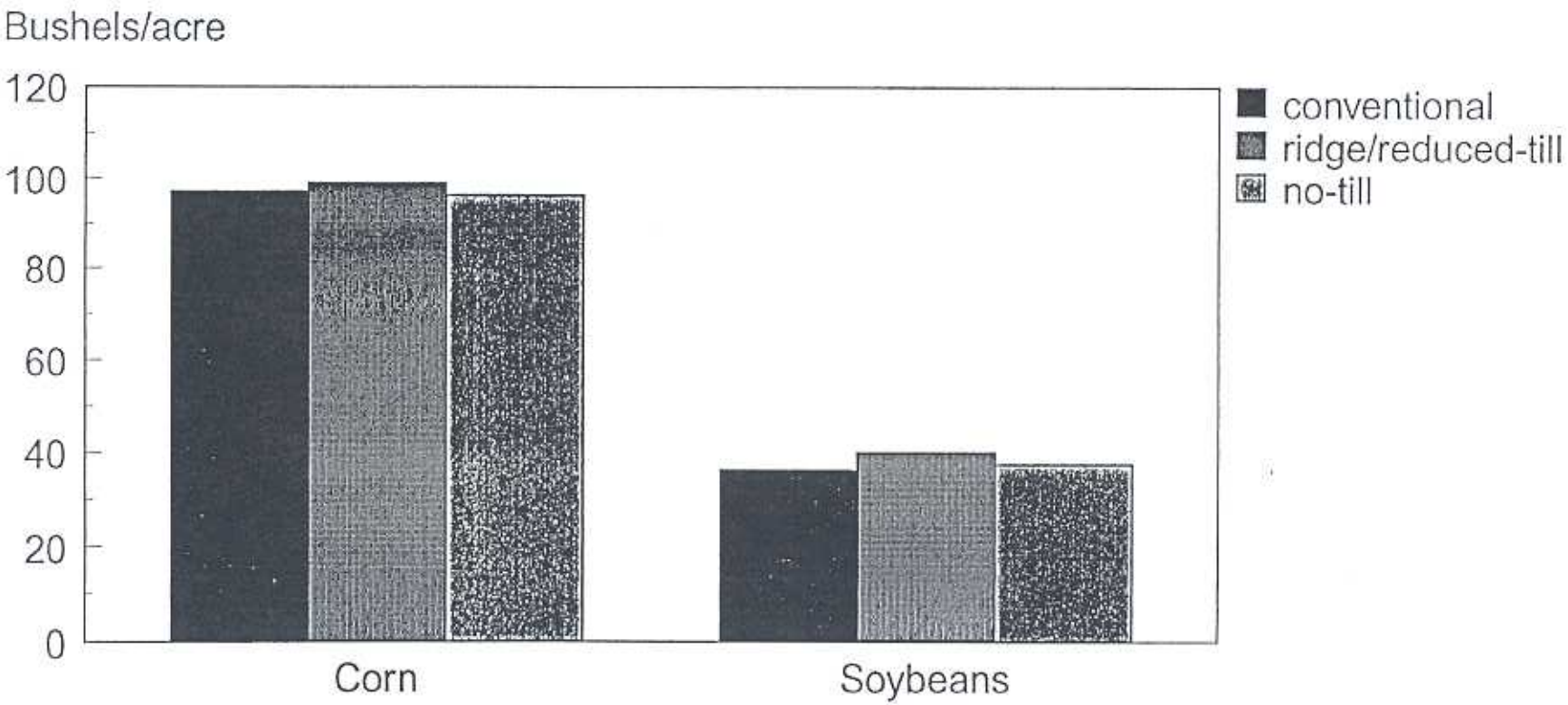
1992



Case Study Farming Systems

Yields

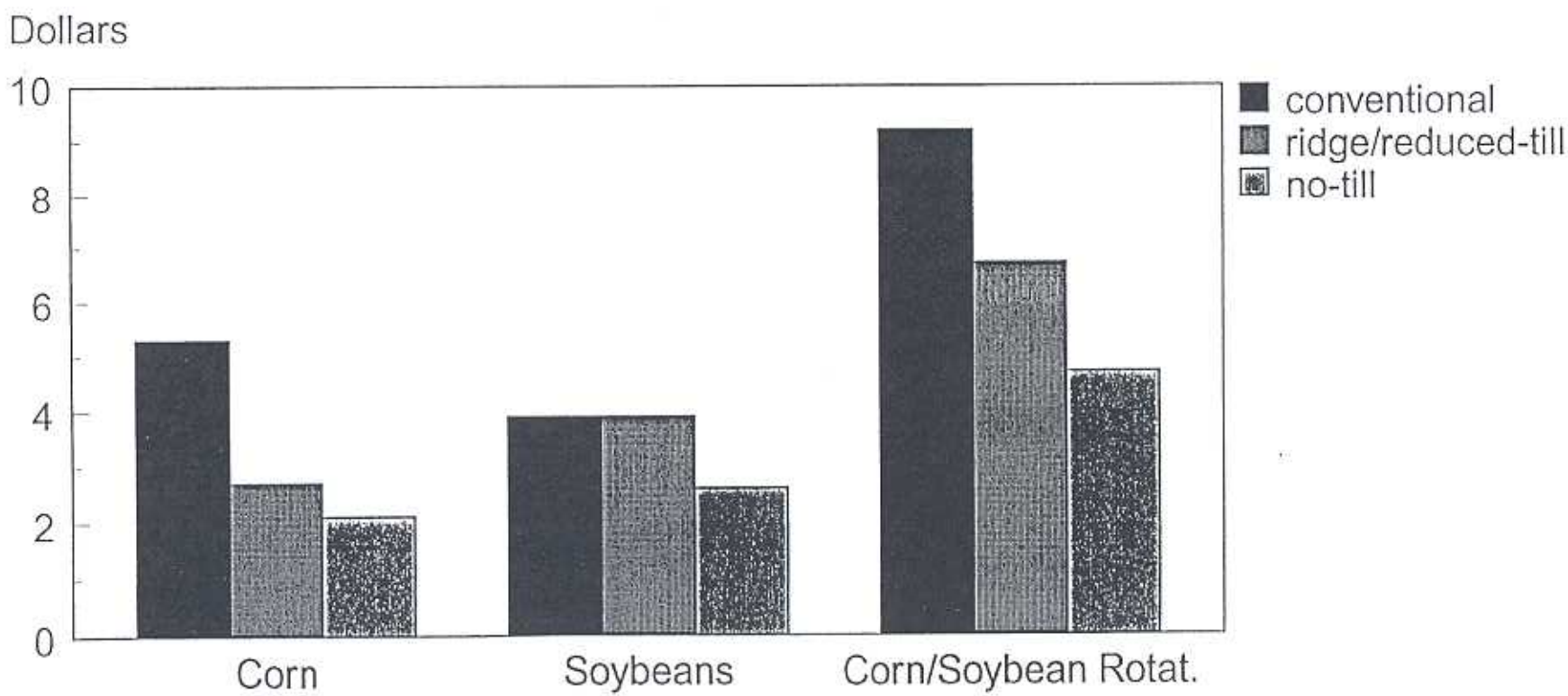
1992



Case Study Farming Systems

Fuel Usage

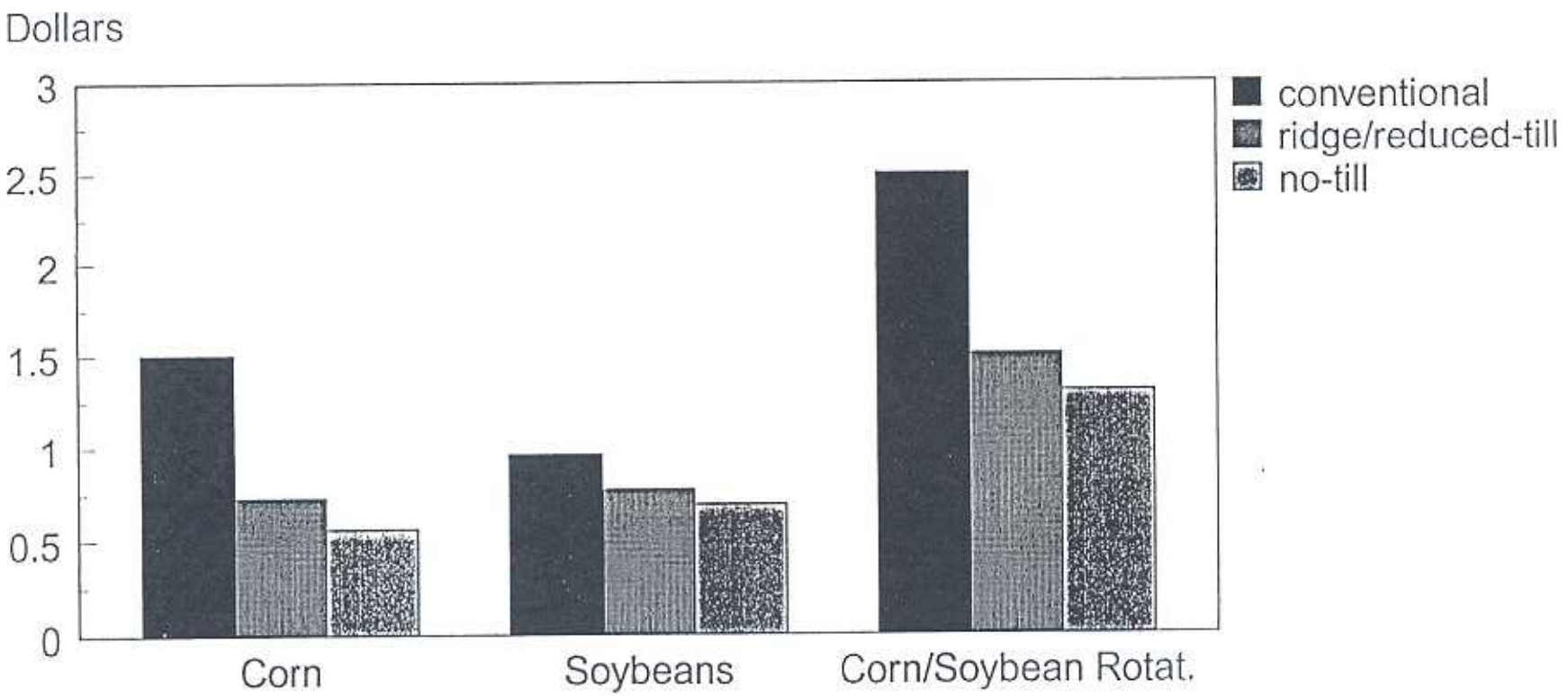
1992



Case Study Farming Systems

Labor Needs

1992



Inputs needed for Residue Management Case Studies

Farmer's Name: Hanson 2

Address: RR Box

Unit: Hanson County

Total Acres in Operating Unit	Acres	$ per acre
Cropland	1400	840.00
Pasture	100	
Rangeland		

Machinery Inventory

Tractors

Model (Optional)	HP
4555 JD	155
4455 JD	145

Implements used in Field work

Name	Width	Model (These items are optional)	Speed	Field	Price	Age	Hours used per Year
Drill	15Ft	750 JD	5mph			1990	
Melroe Sprayer Calyd	50Ft	115	12mph			1984	
Combine 5R 30" 18' Flex hd							

Data for each field

Field name and location Hanson 2 (75 Ac)
Field Value(price, cash rent, share rent) $ 440.00/Ac
Soil Type
Cropping Rotation Corn/Soybeans

Crop 1 Soybeans Yield 35 Price 4.95
ASCS Base Yield 20 Other Yields 2 = 28 bu/Ac.

Field Operations

Date 1992	Tractor	Implement	Input	Amount	Unit
5-15	—	Spray Cage	Roundup	12	oz/Ac
5-20	4455	750 Drill	Seed	70	#/Ac
			Fertilizer (5-20-8-4-2)	15	gal/Ac
6-18	—	Spray Cage	Pursuit	4	oz/Ac
10-10		Combine	19Ft. Flex head	75	Ac

Drying Information
Starting Moisture ____ Ending Moisture ____
Percent Dried ____ Drying Fuel ____

Crop 1 ____ Yield ____ Price ____
ASCS Base Yield ____ Other Yields ____

Field Operations

Date	Tractor	Implement	Input	Amount	Unit

Drying Information
Starting Moisture ____ Ending Moisture ____
Percent Dried ____ Drying Fuel ____

IFY Budget Report - Budget SD-202-4301, Hanson2-nt-beans (c/s), 35 Bushels of Soybeans
is 1 acres of Hanson2-nt-beans (c/s) at Owned, No-till Tillage
Due ... nt is yes, Conservation Plan is yes, No Management Charge Specified
Prepared for Planning Purposes Only.

1. Gross Receipts From Production	Unit	Price /Unit	Quantity	Value / Acre
Soybeans	Bushels	5.600	35.00	196.00
Total Receipts				196.00

2. Production Activities Report		Performance rate	--- Power Unit ---		--- Machinery ---		Labor	--- Cost Per ---	
Date	Operation Description	Acres/hr	Ownership	Operating	Ownership	Operating	Cost	Acre	Unit
Pre-Harvest Activities									
05/15/92	Spray Coupe, 60'	30.727	0.94	0.28	0.00	0.00	0.23	1.45	0.041
05/20/92	No-Till Drill, 15' JD750	5.455	2.12	1.34	4.93	0.33	1.40	10.12	0.289
06/18/92	Spray Coupe, 50'	25.606	0.90	0.30	0.00	0.00	0.28	1.48	0.042
Pre-Harvest SubTotal			3.96	1.92	4.93	0.33	1.91	13.05	0.373
Harvest Activities									
10/10/92	Combine Head Soybean, Med	3.055	15.87	2.25	2.78	0.05	2.72	23.67	0.676
Harvest SubTotal			15.87	2.25	2.78	0.05	2.72	23.67	0.676
Total Cost of Operations			19.83	4.17	7.71	0.38	4.63	36.73	1.049

3. ...rial Usage Report	Units	Quantity	Total Costs	--- Cost Per --- Acre	Unit
Materials Used					
Roundup 3L	Gallons	0.09	5.03	5.03	0.144
Soybean Seed, $.50lb	Pounds	70.00	14.00	14.00	0.400
Nitrogen Liquid	Pounds	6.00	1.32	1.32	0.038
Phosphorus, Liquid	Pounds	24.00	5.28	5.28	0.151
Potassium, Liquid	Pounds	9.60	2.11	2.11	0.060
Pursuit 2L	Gallons	0.03	17.83	17.83	0.509
Trucking, $0.15/bu	Bushels	35.00	5.25	5.25	0.150
Labor Used					
Machinery Labor	Hours	0.67	4.38	n/a	n/a
Other Labor	Hours	0.05	0.26	n/a	n/a
Fuels Used					
Gasoline	Gallons	0.26	0.22	n/a	n/a
Diesel	Gallons	3.02	2.57	n/a	n/a
Total Cost of Inputs			50.82	50.82	1.452
4. Other Operating Costs			2.73	2.73	0.078
Interest On Operating Capital			0.00	0.00	0.000
Crop Drying Costs					

mmary Budget Report - Budget SD-202-4301, Hanson2-nt-beans (c/s), 35 Bushels of Soybeans
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Prepared for Planning Purposes Only.

5. Enterprise Costs		
Ownership Costs per Acre	27.54	0.787
Operating Costs per Acre	62.73	1.792
Total Enterprise Costs	90.27	2.579
6. Return to Land and Management	105.73	3.021
7. Other Charges		
Land Charges	36.00	1.029
Management Charges	0.00	0.000
8. Total Cost of Other Charges and Enterprise Production Costs	126.27	3.608
9. Shared Rent Adjustments	0.00	0.000
10. Net Returns	69.73	1.992

tailed Budget Report - Budget SD-202-4301, Hanson2-nt-beans (c/s), 35 Bushels of Soybeans
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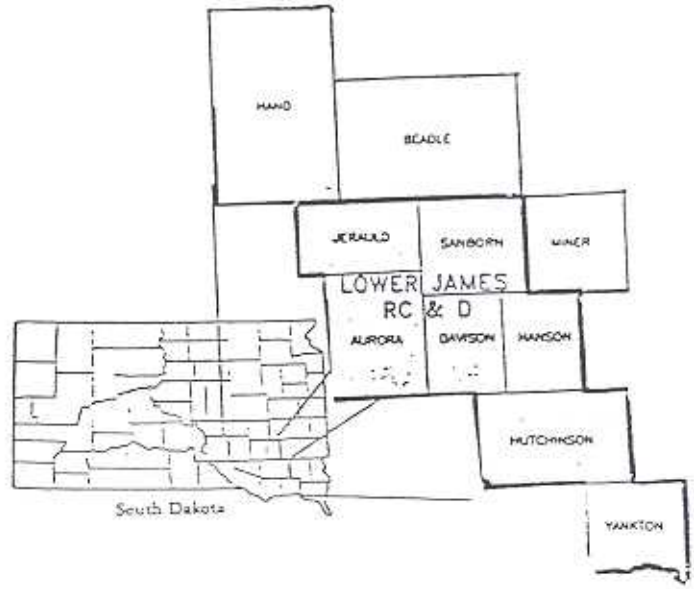
I. Detailed Operations Cost

Date	Machinery Or Input	Units Applied	Owner-ship	Oper-ating	Labor	Total Costs	Cost/ Acre	Cost per Unit
05/15/92	Spray Coupe, 60'	0.0 Hrs(1.0 Times)	0.94	0.28	0.23	1.45	1.45	0.041
	Roundup 3L	0.1 Gallons				5.03	5.03	0.144
	TOTAL Machinery Cost		0.94	0.28	0.23	1.45	1.45	0.041
	TOTAL Input Costs					5.03	5.03	0.144
	TOTAL Operation Cost					6.48	6.48	0.185
05/20/92	Tractor 160 hp	0.2 Hrs(1.0 Times)	2.12	1.34	1.31	4.77	4.77	0.136
	No-Till Drill, 15' JD750		4.93	0.33	0.09	5.35	5.35	0.153
	Soybean Seed, $.50lb	70.0 Pounds				14.00	14.00	0.400
	Nitrogen Liquid	6.0 Pounds				1.32	1.32	0.038
	Phosphorus, Liquid	24.0 Pounds				5.28	5.28	0.151
	Potassium, Liquid	9.6 Pounds				2.11	2.11	0.060
	TOTAL Machinery Cost		7.05	1.67	1.40	10.12	10.12	0.289
	TOTAL Input Costs					22.71	22.71	0.649
	TOTAL Operation Cost					32.83	32.83	0.938
06/18/92	Spray Coupe, 50'	0.0 Hrs(1.0 Times)	0.90	0.30	0.28	1.48	1.48	0.042
	Pursuit 2L	0.0 Gallons				17.83	17.83	0.509
	TOTAL Machinery Cost		0.90	0.30	0.28	1.48	1.48	0.042
	TOTAL Input Costs					17.83	17.83	0.509
	TOTAL Operation Cost					19.31	19.31	0.552
10/10/92	Combine, Medium	0.3 Hrs(1.0 Times)	15.87	2.25	2.55	20.68	20.68	0.591
	Combine Head Soybean, Med		2.78	0.05	0.16	3.00	3.00	0.086
	Trucking, $0.15/bu	35.0 Bushels				5.25	5.25	0.150
	TOTAL Machinery Cost		18.65	2.30	2.72	23.67	23.67	0.676
	TOTAL Input Costs					5.25	5.25	0.150
	TOTAL Operation Cost					28.92	28.92	0.826
	TOTAL Machinery Cost					36.73	36.73	1.049
	TOTAL Input Cost					50.82	50.82	1.452
	TOTAL Budget Cost					87.55	87.55	2.501

LowerJames

Alliance For Crop Residue Management?



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